

In the claims:

Please substitute the following full listing of claims for the claims as originally filed or most recently amended. Claims 2, 28, 55 - 57 and 64 are canceled without prejudice or disclaimer.

1. (Currently Amended) A central pattern generator-based system for controlling at least one mechanical limb, comprising
at least one mechanical limb;
a system for phase adjustment of the central pattern generator based on a sensory trigger in or derived from sensory feedback; and
a non-biological central pattern generator that autonomously generates a rhythmic pattern of commands for controlling repetitive cyclical movement of the at least one mechanical limb wherein said commands and said rhythmic pattern of commands are adapted as a function of sensory feedback.

2. (Canceled)

3. (Currently Amended) The central pattern generator-based system of claim 1, ~~including~~ wherein:
a said system for phase adjustment of the central pattern generator being based on
at least one sensory trigger in or derived from sensory feedback; and
a system for controlling firing frequency of motoneurons as a function of the sensory feedback or the sensory trigger.

4. (Original) The central pattern generator-based system of claim 1, further including at least one memory device.

5. (Original) The central pattern generator-based system of claim 4, wherein the memory device controls adaptation of output from the central pattern generator.

6. (Original) The central pattern generator-based system of claim 5, wherein the output includes integrate-and-fire neurons.

7. (Original) The central pattern generator-based system of claim 1, wherein the system is at least one chip.

8. (Original) The central pattern generator-based system of claim 7, including at least one chip containing electronic analogues of biological neurons, synapses and time-constraints.

9. (Original) The central pattern generator-based system of claim 7, including at least one chip that includes dynamic memories and phase modulators.

10. (Currently Amended) ~~The central pattern generator-based system of claim 1,~~ A central pattern generator-based system for controlling at least one mechanical limb, comprising
at least one mechanical limb; and
a non-biological central pattern generator that autonomously generates a rhythmic pattern of commands for controlling repetitive cyclical movement of the at least one mechanical limb wherein said commands and said

rhythmic pattern of commands are adapted as a function of sensory feedback

wherein the system is a non-linear oscillator including electronic analogues of biological neurons, synapses and time-constraints, dynamic memories and phase modulators.

11. (Original) The central pattern generator-based system of claim 7, wherein the system includes at least one chip in which components are integrated with hardwired or programmable circuits.

12. (Original) The central pattern generator-based system of claim 1, wherein the central pattern generator is a distributed system of at least two non-linear oscillators.

13. (Original) The central pattern generator-based system of claim 12, wherein the distributed system includes at least one neuron phasically coupled to a neuron or a sensory input.

14. (Original) The central pattern generator-based system of claim 12, wherein the distributed system includes at least two neurons phasically coupled to each other, to another neuron, or to a sensory input.

15. (Original) The central pattern generator-based system of claim 14, wherein phasic coupling is in-phase, 180 degrees out of phase, or any number of degrees out of phase.

16. (Original) The central pattern generator-based system of claim 14, wherein phasic coupling is based on rhythmic movement application.

17. (Original) The central pattern generator-based system of claim 14, including a phase control circuit.

18. (Original) The central pattern generator-based system of claim 14, including at least one integrate-and-fire spiking motoneuron driven by the phasically coupled neurons.

19. (Original) The central pattern generator-based system of claim 1, including at least one muscle.

20. (Original) The central pattern generator-based system of claim 1, wherein the system is a robot.

21. (Original) The central pattern generator-based system of claim 7, wherein the system includes a central pattern generator chip and at least one biological neuron.

22. (Original) The central pattern generator-based system of claim 21, including multiple chips.

23. (Original) The central pattern generator-based system of claim 1, including at least one sensor for collecting sensory feedback.

24. (Original) The central pattern generator system of claim 23, including a system for phase adjustment of the central pattern generator based on at least one sensory trigger in the received sensory feedback.

25. (Original) The central pattern generator-based system of Claim 1, wherein the sensory feedback is received from the at least one mechanical limb.

26. (Original) The central pattern generator-based system of Claim 1, wherein the sensory feedback is received from a sensing modality.

27. (Currently Amended) A central pattern generator-based system for controlling a biological system for rhythmic movement, comprising
an interface with a biological system that can provide sensory feedback from said biological system;
a system for phase adjustment of the central pattern generator based on a sensory trigger in or derived from sensory feedback; and
a non-biological central pattern generator that autonomously generates a rhythmic pattern of commands for controlling repetitive cyclical movements of the biological system wherein said commands and said rhythmic pattern of commands are adapted as a function of sensory feedback.

28. (Canceled)

29. (Currently Amended) ~~The central pattern generator-based system of claim 27, including:~~ A central pattern generator-based system for controlling a biological system for rhythmic movement, comprising
an interface with a biological system that can provide sensory feedback from said biological system;
a non-biological central pattern generator that autonomously generates a rhythmic pattern of commands for controlling repetitive cyclical movements of the

biological system wherein said commands and said rhythmic pattern of commands are adapted as a function of sensory feedback;

a system for phase adjustment of the central pattern generator based on at least one sensory trigger in or derived from sensory feedback; and

a system for controlling firing frequency of motoneurons as a function of the sensory feedback or the sensory trigger.

30. (Original) The central pattern generator-based system of claim 27, further including at least one memory device.

31. (Original) The central pattern generator-based system of claim 30, wherein the memory device controls adaptation of output from the central pattern generator.

32. (Original) The central pattern generator-based system of claim 31, wherein the output includes integrate-and-fire neurons.

33. (Original) The central pattern generator-based system of claim 27, wherein the system is at least one chip.

34. (Original) The central pattern generator-based system of claim 33, including at least one chip containing electronic analogues of biological neurons, synapses and time-constraints.

35. (Original) The central pattern generator-based system of claim 33, including at least one chip that includes dynamic memories and phase modulators.

36. (Currently Amended) ~~The central pattern generator-based system of claim 27;~~ A central pattern generator-based system for controlling a biological system for rhythmic movement, comprising
an interface with a biological system that can provide sensory feedback from said biological system;
a non-biological central pattern generator that autonomously generates a rhythmic pattern of commands for controlling repetitive cyclical movements of the biological system wherein said commands and said rhythmic pattern of commands are adapted as a function of sensory feedback;

wherein the system is a non-linear oscillator including electronic analogues of biological neurons, synapses and time-constraints, dynamic memories and phase modulators.

37. (Original) The central pattern generator-based system of claim 33, wherein the system includes at least one chip in which components are integrated with hardwired or programmable circuits.

38. (Original) The central pattern generator-based system of claim 27, wherein the central pattern generator is a distributed system of at least two non-linear oscillators.

39. (Original) The central pattern generator-based system of claim 38, wherein the distributed system includes at least one neuron phasically coupled to a neuron or a sensory input.

40. (Original) The central pattern generator-based system of claim 38, wherein the distributed system

includes at least two neurons phasically coupled to each other, to another neuron, or to a sensory input.

41. (Original) The central pattern generator-based system of claim 40, wherein phasic coupling is in-phase, 180 degrees out of phase, or any number of degrees out of phase.

42. (Original) The central pattern generator-based system of claim 40, wherein phasic coupling is based on rhythmic movement application.

43. (Original) The central pattern generator-based system of claim 40, including a phase control circuit.

44. (Original) The central pattern generator-based system of claim 40, including at least one integrate-and-fire spiking motoneuron driven by the phasically coupled neurons.

45. (Original) The central pattern generator-based system of claim 27, including at least one muscle.

46. (Original) The central pattern generator-based system of claim 33, wherein the system includes a central pattern generator chip and at least one biological neuron.

47. (Original) The central pattern generator-based system of claim 46, including multiple chips.

48. (Original) The central pattern generator-based system of claim 27, including at least one sensor for collecting sensory feedback.

49. (Original) The central pattern generator system of claim 48, including a system for phase adjustment of the central pattern generator based on at least one sensory trigger in the received sensory feedback.

50. (Original) The central pattern generator-based system of Claim 27, wherein the sensory feedback is received from the at least one biological limb.

51. (Original) The central pattern generator-based system of Claim 27, wherein the sensory feedback is received from a sensing modality.

52. (Original) A method for controlling a mechanical or biological system for rhythmic movement, comprising:

(A) measuring sensory feedback to obtain measured sensory feedback;

(B) processing the measured sensory feedback to obtain data for a plurality of designated parameters; and

(C) via a central pattern generator-based system, applying a set of rules to the obtained data to generate at least one signal for commanding the limb or biological system for rhythmic movement, wherein the central pattern generator-based system comprises a circuit that mimics a biological central pattern generator.

53. (Original) The method of claim 52, including (D) via the central pattern generator-based system, applying the generated signal to command the limb or biological system for rhythmic movement.

54. (Original) The method of Claim 52, wherein the central pattern generator system comprises a circuit comprising at least two coupled non-linear oscillators.

55. - 57. (Canceled)

58. (Currently Amended) ~~The autonomous movement device of claim 57,~~ The central pattern-based system as recited in claim 27, including at least one mechanical limb.

59. (Original) The autonomous device of claim 58 wherein the limb is a leg, arm, wing or appendage for swimming.

60. (Original) The movement device of claim 58 including at least two limbs.

61. (Currently Amended) ~~The movement device of claim 57,~~ The central pattern-based system as recited in claim 27, wherein the ~~device~~ system is a breathing controller.

62. (Currently Amended) ~~The movement device of claim 57,~~ The central pattern-based system as recited in claim 27, wherein the ~~device~~ system is a pacemaker.

63. (Currently Amended) ~~The movement device of claim 57,~~ The central pattern-based system as recited in claim 27, wherein the ~~device~~ system is a running device.

64. (Canceled)

65. (Currently Amended) A method for modifying a continuous waveform provided by a non-biological central pattern generator, comprising the steps of:

(A) provision of a continuous waveform by a non-biological central pattern generator;

(B) provision of sensory feedback to the non-biological central pattern generator;

² (C) rule-application by the non-biological central pattern generator to the sensory feedback;

(D) based on the rule-application, determination by the non-biological central pattern generator to modify or maintain the continuous wave form.

66. (Original) The method of claim 65, wherein the non-biological central pattern generator modifies the wave form.

67. (Original) The method of claim 65, wherein the rule-application is the application of adaptive ring rules.